Name:

at1117paper: Complete the Square (v304)

Example

A square's edge length is x feet. A rectangle has a height of x feet and a width of 56 feet. Their combined area, found by adding the square's area and the rectangle's area, is 1425 square feet. What is the value of x?

Example's Solution

$$x^2 + 56x = 1425$$

To complete the square, add $\left(\frac{56}{2}\right)^2 = 784$ to both sides.

$$x^2 + 56x + 784 = 2209$$

Recognize the left side is now a perfect-square trinomial. Factor the left side.

$$(x + 28)^2 = 2209$$

Undo the squaring.

$$x + 28 = \pm\sqrt{2209}$$

$$x + 28 = \pm 47$$

Subtract 28 from both sides.

$$x = -28 \pm 47$$

In this geometric example, we are only concerned about the positive solution. So,

$$x = 19$$

Question 1

A square's edge length is x feet. A rectangle has a height of x feet and a width of 30 feet. The total area, of the square and rectangle, is 504 square feet. What is the value of x?

$$x^2 + 30x = 504$$

$$x^2 + 30x + 225 = 729$$

$$(x + 15)^2 = 729$$

$$x + 15 = \pm 27$$

$$x = 12$$

Question 2

A square's edge length is x feet. A rectangle has a height of x feet and a width of 48 feet. The total area, of the square and rectangle, is 868 square feet. What is the value of x?

$$x^2 + 48x = 868$$
$$x^2 + 48x + 576 = 1444$$
$$(x + 24)^2 = 1444$$
$$x + 24 = \pm 38$$
$$x = 14$$

Question 3

A square's edge length is x feet. A rectangle has a height of x feet and a width of 38 feet. The total area, of the square and rectangle, is 315 square feet. What is the value of x?

$$x^2 + 38x = 315$$
$$x^2 + 38x + 361 = 676$$
$$(x + 19)^2 = 676$$
$$x + 19 = \pm 26$$
$$x = 7$$